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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|--------------------------|------------------|
| 09/892,225 | 06/25/2001 | Shunpei Yamazaki | 07977/279001/US5023/5025 | 1969 |

7590 12/26/2002

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| EXAMINER |
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SONG, MATTHEW J

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| ART UNIT | PAPER NUMBER |
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1765

DATE MAILED: 12/26/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/892,225

Applicant(s)

YAMAZAKI ET AL.

Examiner

Matthew J Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☐ Responsive to communication(s) filed on _____.

2a) ☐ This action is **FINAL**.

2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-34 is/are pending in the application.

4a) Of the above claim(s) 1-4, 8-14, 20-22, 24-28 and 32-34 is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 5-7, 15-19, 23 and 29-31 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some * c) ☐ None of:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4, 6.

4) ☐ Interview Summary (PTO-413) Paper No(s) _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other:

DETAILED ACTION

Election/Restrictions

Claims 1-4,8-14,20-22,24-28 and 32-34 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 8.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 5, 7, 15, 16, 18, and 19 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Maekawa (US 6,066,547).

In a method of forming a Thin film transistor, note entire reference, Maekawa teaches a transparent substrate of glass or quartz, a step 90 for providing an amorphous film, where silicon, germanium or silicon-germanium alloys are typical amorphous films, for forming a thin film transistor, a step 92 for depositing a layer of an amorphous film, a step 94 for introducing a transition metal to induce rapid crystallization of the amorphous film and a step 96 for rapid thermal annealing to convert the amorphous film into a polycrystalline film (Fig 20 and col 11,

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In 1-67). Maekawa also teaches the rapid thermal annealing step includes annealing with a tungsten-halogen lamp, Xe arc lamp and an excimer laser (col 12, ln 1-50).

Maekawa is silent to both amorphous films 90 and 92 are crystallized. It is inherent that both amorphous films would be crystallized by the rapid thermal annealing step because the high temperatures cause one amorphous layer to crystallize would inherently cause an underlying contacting another layer to crystallize because the heat would conduct through the film. In any event, it would have been obvious to a person of ordinary skill in the art at the time of the invention to Maekawa to crystallize both layers to improve the carrier mobility of the device (col 1, ln 45-60).

Referring to claim 19, Applicant is reminded apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims (In re Tarczy-Hornoch 158 USPQ 141).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 5-7 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu (US 5,753,541).

Shimizu discloses a method of fabricating a polycrystalline silicon-germanium thin film transistor (TFT), note entire reference, on an insulating substrate, comprising forming an

amorphous silicon layer, an amorphous germanium layer and converting the amorphous silicon layer and the amorphous germanium layer into polycrystalline layers (col 3, ln 1-25). Shimizu also discloses the amorphous silicon and germanium layers are formed by plasma CVD (col 3, ln 26-40 and Example 2). Shimizu also discloses both of the amorphous layers are converted into polycrystalline layer by annealing using an ultraviolet laser light, such as an excimer laser (col 3, ln 41-67 and Example 3). Shimizu also discloses a source electrode 2 and a drain electrode 3 and an amorphous silicon film used as an ohmic contact layer 4, this reads on applicant's insulating film covering an electrode, and thereafter forming an amorphous silicon and amorphous germanium layer, which are crystallized by laser light (col 5, ln 1-67).

The sole difference between Shimizu and the instantly claimed invention is the first amorphous layer comprises germanium, where Shimizu discloses forming a second layer comprising germanium. Selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results (MPEP 2144.04). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Shimizu by depositing the germanium layer first and the silicon layer second because order of performing process steps is held to be obvious.

5. Claims 15-16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over in Maekawa (US 6,066,547) view of Shimizu (US 5,753,541).

Maekawa teaches all of the limitations of claim 5, as discussed previously, except Maekawa is silent to both amorphous films are crystallized.

Shimizu discloses a method of fabricating a polycrystalline silicon-germanium thin film transistor (TFT), note entire reference, on an insulating substrate, comprising forming an amorphous silicon layer, an amorphous germanium layer and converting the amorphous silicon layer and the amorphous germanium layer into polycrystalline layers (col 3, ln 1-25). Shimizu also discloses the amorphous silicon and germanium layers are formed by plasma CVD (col 3, ln 26-40 and Example 2). Shimizu also discloses both of the amorphous layers are converted into polycrystalline layers by annealing using an ultraviolet laser light, such as an excimer laser (col 3, ln 41-67 and Example 3). Shimizu also discloses a source electrode 2 and a drain electrode 3 and an amorphous silicon film used as an ohmic contact layer 4, this reads on applicant's insulating film covering an electrode, and thereafter forming an amorphous silicon and amorphous germanium layer, which are crystallized by laser light (col 5, ln 1-67).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Maekawa with Shimizu to improve the carrier mobility of the device.

Referring to claim 16, the combination of Maekawa and Shimizu teaches a amorphous layer of a silicon-germanium alloy, where germanium reads on applicant's element having a larger atomic radius than silicon.

6. Claims 19 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maekawa (US 6,066,547) in view of Shimizu (US 5,753,541) as applied to claims 15-16 above, and further in view of Zhang et al (US 5,578,520).

The combination of Maekawa and Shimizu teaches all of the limitations of claim 19, as discussed previously in claim 15. The combination of Maekawa and Shimizu is silent to a CVD

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apparatus with a turbo molecular pump used in an exhaust means connected to a reaction chamber.

In a plasma CVD apparatus for depositing amorphous silicon, Zhang et al teaches a CVD apparatus 2, where a vacuum evacuation apparatus comprising a turbo molecular pump and a rotary pump connected in series, so that impurity concentration inside the chamber may be maintained as low as possible (Fig 2 and col 6, ln 1-67). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Maekawa and Shimizu with Zhang et al to maintain the impurity concentration in the chamber as low as possible.

Also, Applicant is reminded apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims (In re Tarczy-Hornoch 158 USPQ 141).

7. Claims 15-17 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu (US 5,753,541) in view of Teramoto et al (US 5,923,966).

Shimizu et al teaches all of the limitations of claim 15, as discussed previously in claim 5, except introducing an element capable of promoting crystallization of silicon into the first amorphous semiconductor film or the second amorphous semiconductor film.

In a laser processing method, note entire reference, Teramoto et al teaches an amorphous Si film 603 formed by plasma CVD on a glass substrate 601, introducing nickel for promoting crystallization into the surface of the amorphous silicon film, heat treating the amorphous Si film 603, thereby providing a crystalline Si film 607 and irradiating the crystalline silicon film 607 is

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irradiated with last light to further promote the crystallization of the crystalline silicon film 607 (Embodiment 2). Teramoto et al also teaches a KrF excimer laser, a XeCl excimer laser, other excimer lasers, or other means emitting coherent light can be used as a laser (col 33, ln 30-45). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Shimizu with Teramoto et al to promote the crystallization of an amorphous film.

8. Claims 19 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu (US 5,753,541) in view of Teramoto et al (US 5,923,966) as applied to claims 15-16 above, and further in view of Zhang et al (US 5,578,520).

The combination of Shimizu and Teramoto teaches all of the limitations of claim 19, as discussed previously in claim 15. The combination of Shimizu and Teramoto is silent to a CVD apparatus with a turbo molecular pump used in an exhaust means connected to a reaction chamber.

In a plasma CVD apparatus for depositing amorphous silicon, Zhang et al teaches a CVD apparatus 2, where a vacuum evacuation apparatus comprising a turbo molecular pump and a rotary pump connected in series, so that impurity concentration inside the chamber may be maintained as low as possible (Fig 2 and col 6, ln 1-67). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Shimizu and Teramoto with Zhang et al to maintain the impurity concentration in the chamber as low as possible.

Also, Applicant is reminded apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims (In re Tarczy-Hornoch 158 USPQ 141).

9. Claims 18 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimizu (US 5,753,541) in view of Teramoto et al (US 5,923,966) as applied to claims 15-16 above, and further in view of Maekawa (US 6,066,547).

The combination of Shimizu and Teramoto et al teaches all of the limitations of claim 18, as discussed previously. The combination of Shimizu and Teramoto et al is silent to irradiating with a light from one selected from the group consisting of a halogen lamp, a xenon lamp, a mercury lamp, a metal halide lamp as a light source.

In a method of forming a Thin film transistor, note entire reference, Maekawa teaches a transparent substrate of glass or quartz, a step 90 for providing an amorphous film, where silicon, germanium or silicon-germanium alloys are typical amorphous films, for forming a thin film transistor, a step 92 for depositing a layer of an amorphous film, a step 94 for introducing a transition metal to induce rapid crystallization of the amorphous film and a step 96 for rapid thermal annealing to convert the amorphous film into a polycrystalline film (Fig 20 and col 11, ln 1-67). Maekawa also teaches the rapid thermal annealing step includes annealing with a tungsten-halogen lamp, Xe arc lamp and an excimer laser (col 12, ln 1-50). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Shimizu and Teramoto et al with Maekawa because substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06).

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10. Claims 17 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maekawa (US 6,066,547) in view of Teramoto et al (US 5,923,966).

Maekawa et al teaches all of the limitations of claim 17, as discussed previously in claim 15, except irradiating with a laser light to obtain a higher crystallinity.

In a laser processing method, note entire reference, Teramoto et al teaches an amorphous Si film 603 formed by plasma CVD on a glass substrate 601, introducing nickel for promoting crystallization into the surface of the amorphous silicon film, heat treating the amorphous Si film 603, thereby providing a crystalline Si film 607 and irradiating the crystalline silicon film 607 is irradiated with last light to further promote the crystallization of the crystalline silicon film 607 (Embodiment 2). Teramoto et al also teaches a KrF excimer laser, a XeCl excimer laser, other excimer lasers, or other means emitting coherent light can be used as a laser (col 33, ln 30-45). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Maekawa with Teramoto et al to further promote the crystallization of a crystalline film.

Double Patenting

11. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

12. Claims 5-7, 15-16, 19 and 31 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 7, 50-51, 59-60, 66 of U.S. Patent No. 6,482,684. Although the conflicting claims are not identical, they are not patentably distinct from each other because the difference between the claims of the instant application and US 6,482,684 is the instant claims first amorphous layer comprising germanium and a second amorphous semiconductor layer, where US 6,482,684 claims an amorphous semiconductor film and forming a film comprising germanium, which is inherently amorphous because the film is formed on an amorphous film using conventional deposition techniques, i.e. plasma CVD. The sole difference between the claims of the instant application and US 6,482,684 is the order the semiconductor thin films are deposited. Selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results (MPEP 2144.04). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify US 6,482,684 by depositing the germanium layer first and the silicon layer second because order of performing process steps is held to be obvious.

Referring to claims 19 and 31, Applicant is reminded apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims (In re Tarczy-Hornoch 158 USPQ 141).

Conclusion

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13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin L Utech can be reached on 703-308-3868. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS
December 20, 2002



ROBERT KUNEMUND
PRIMARY EXAMINER